

Super Neutrino Beam from FNAL to the Homestake Neutrino Detector

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Representing the Homestake Neutrino Detector Group (hep-ex/0608023)

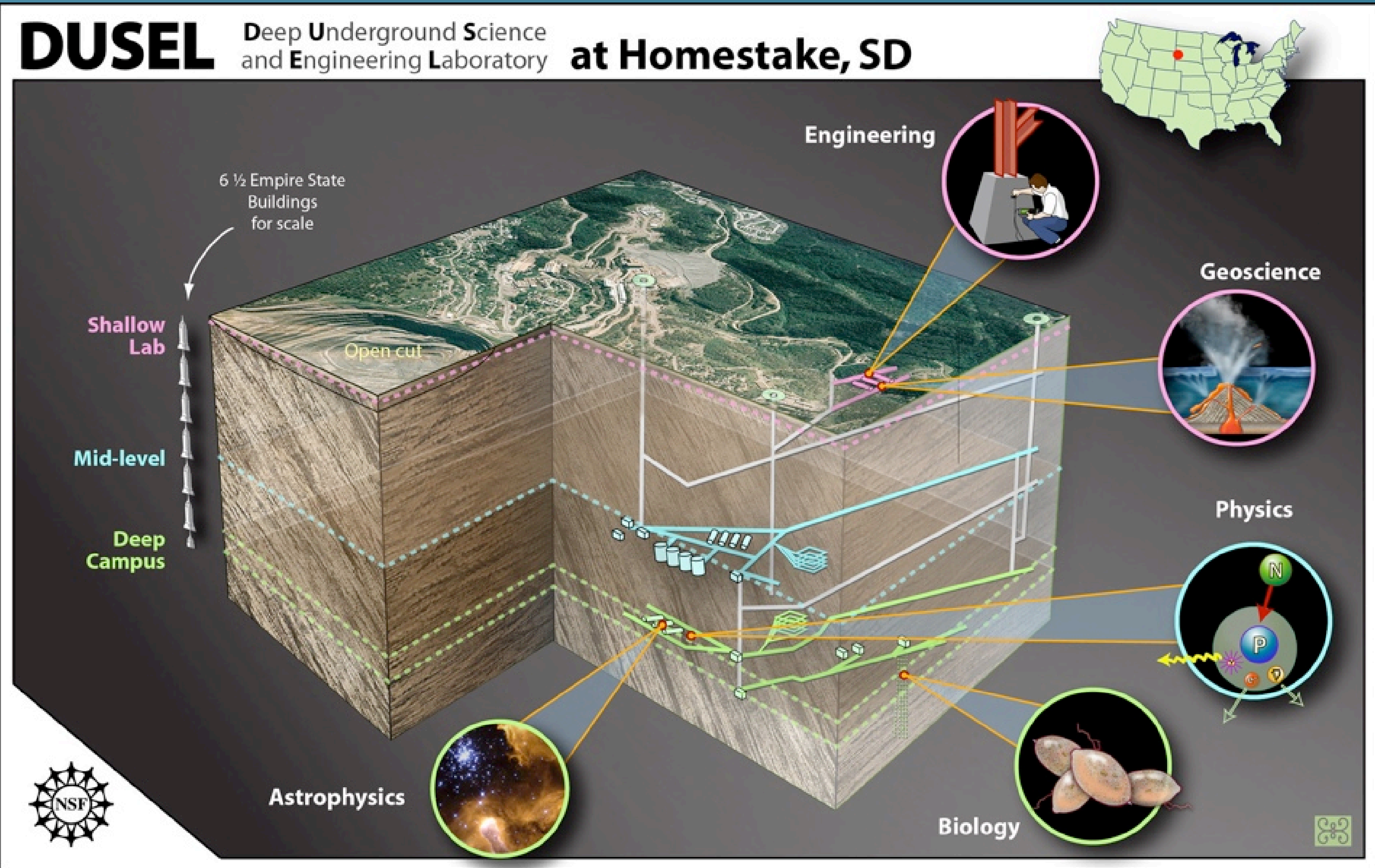
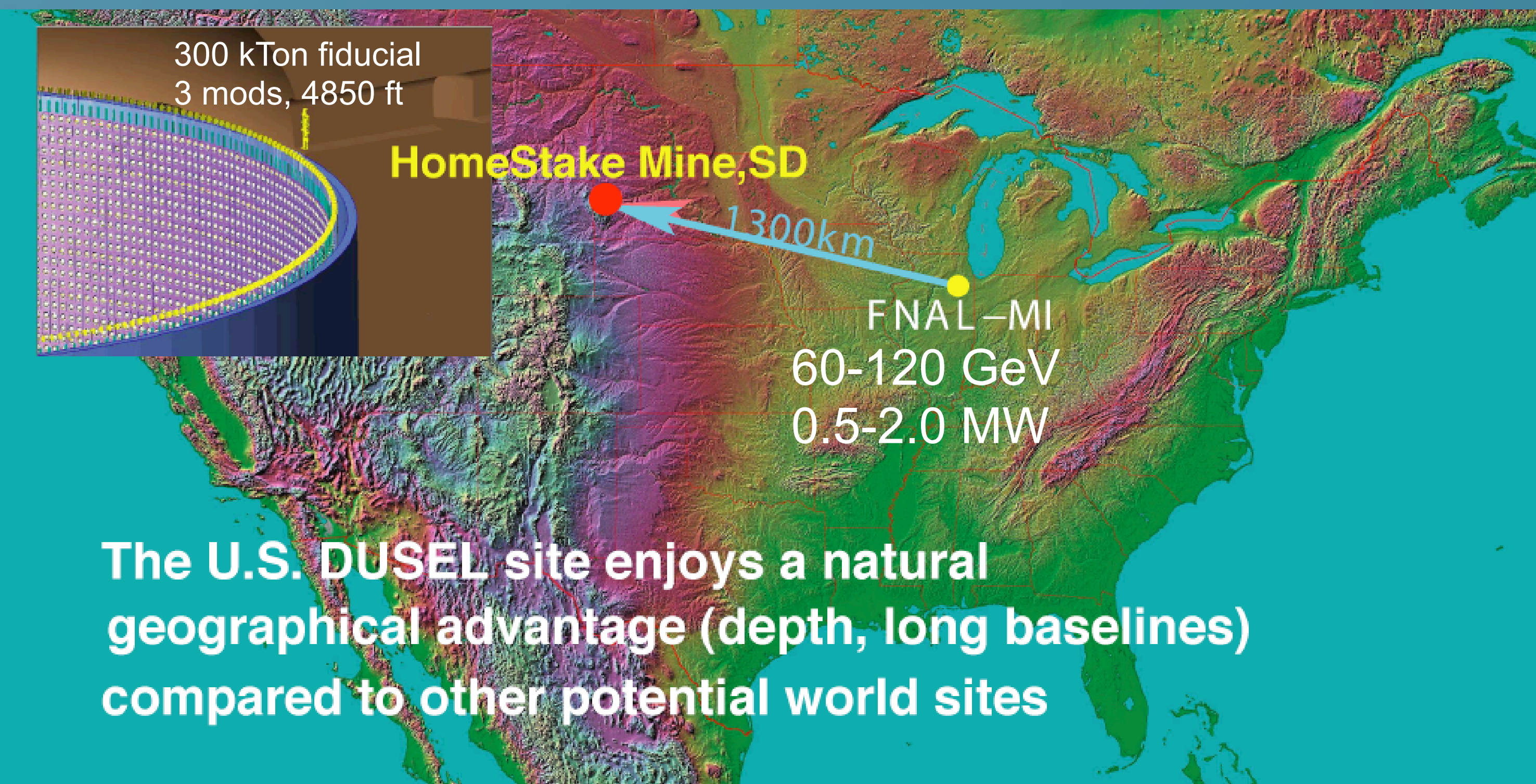
INTRODUCTION The new science of neutrino mass and mixing points to the same mass scale as the Grand Unification mass scale from the unification of the fundamental constants ($\sim 10^{16}$ GeV). Further exploration needs a detector of unprecedented size and an intense neutrino beam over a very long distance. Such a project could be a landmark scientific endeavor capable of a broad attack on neutrino oscillations, nucleon decay, and neutrino astrophysics.

OBJECTIVE

- ◆ Initial Detector ~ 300 kTon
- ◆ Plan for 1 Megaton
- ◆ Wide band neutrino beam (0.5-6 GeV)
- ◆ 1-2 MW of proton power
- ◆ Baseline of ~ 1300 km

DETECTOR SITE HOMESTAKE

- ◆ The chosen site for a US National Science Foundation Deep Underground Science and Engineering Laboratory
- ◆ Deepest and largest such site in the western hemisphere
- ◆ Capable of addressing all underground physics goals identified in recent reports.
- ◆ Documented and reviewed to be capable of hosting very large underground detectors
- ◆ Dedicated to scientific use, no interference from mining or transportation



NuMI-HOMESTAKE

- ◆ 60-120 GeV protons Main Injector
- ◆ Conventional horn focussing
- ◆ 1-2 MW operation
- ◆ Decay tunnel 4 m dia, 400 m long

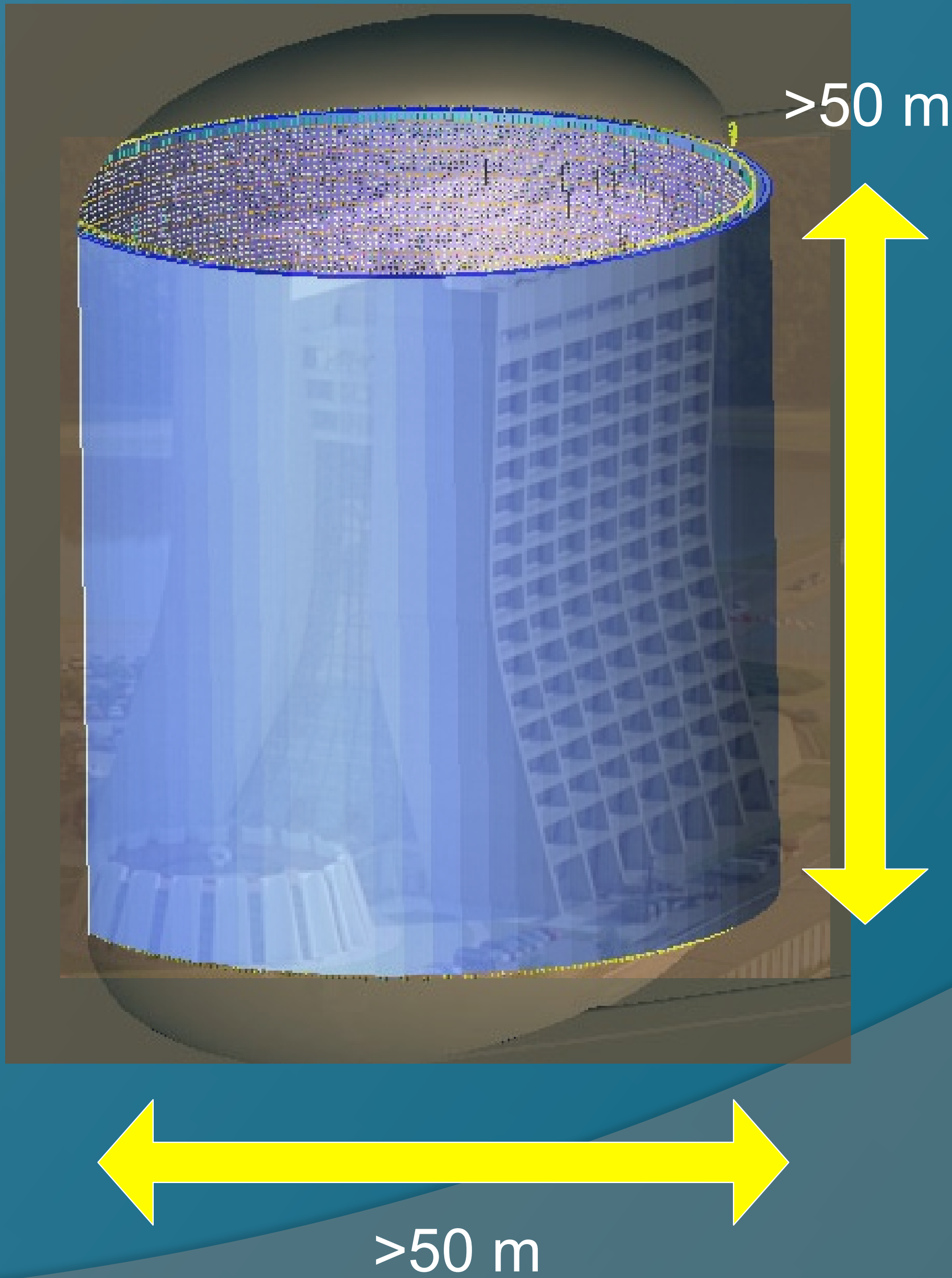
Beam (2MW)	CC μ Events*
120 GeV (0 deg.)	202000/yr
60 GeV (0 deg.)	154000/yr

* w/o oscillations

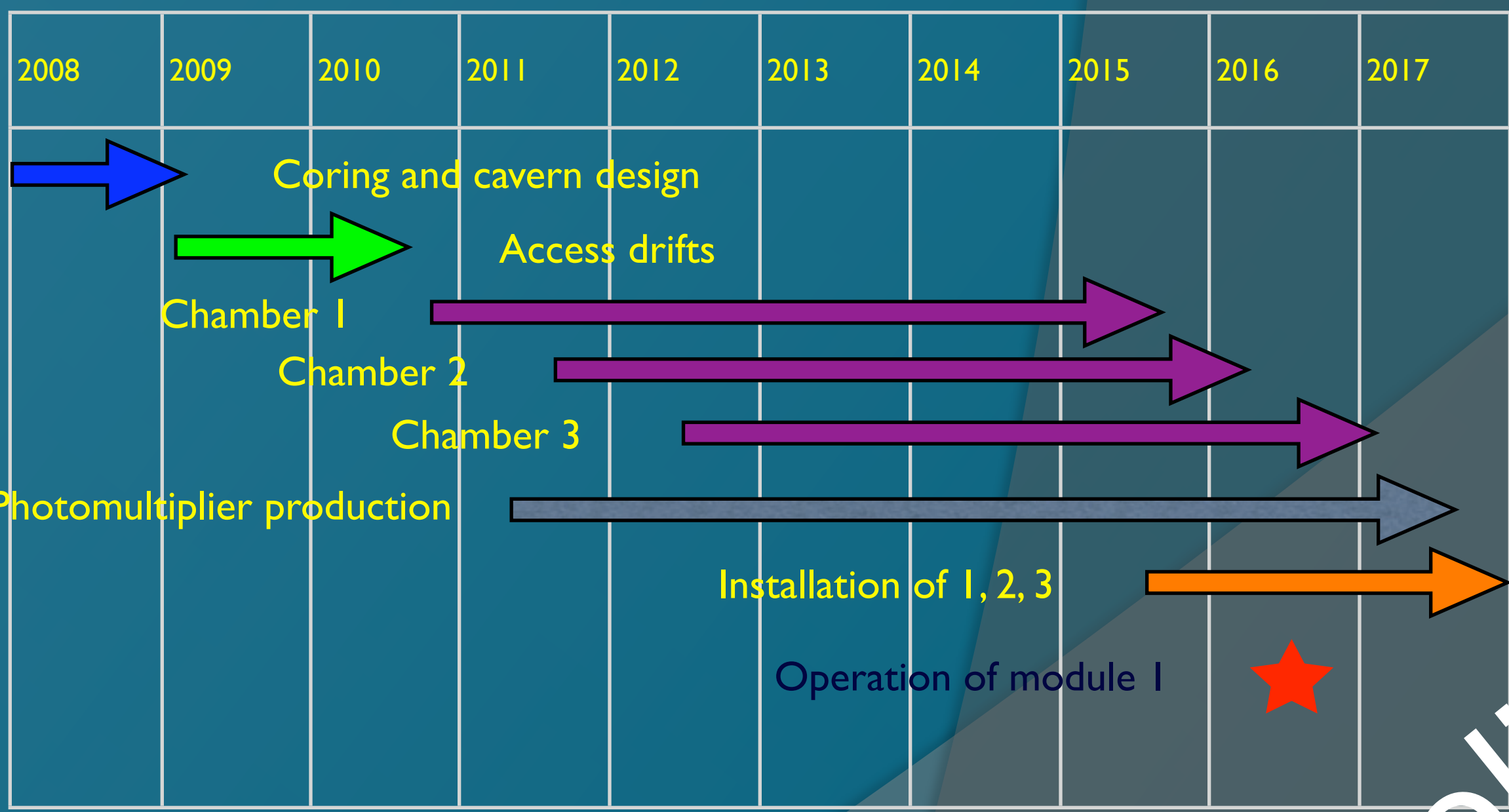


HOMESTAKE NEUTRINO DETECTOR PROJECT

- ◆ Initial detector - 300 kT in 3 modules
- ◆ Modular fiducial mass - ~ 100 kilotons
- ◆ Modular Shape - Cylinder - 50-60 m dia/height
- ◆ Depth - 4200 mwe - (cosmic muons ~ 0.1 Hz)
- ◆ PMT coverage - 25% (equi. 35% with 20 in.)
- ◆ High granularity - 10-12 inch PMT 50000/mod
- ◆ Construction time - ~ 5 yrs for first, 8 yrs for all
- ◆ Cost - $\sim \$115$ M/module
- ◆ Ultimate detector - 10 modules (1 Megaton)



DETECTOR COST & SCHEDULE



Detector cost for 3 modules

Cavity constr. (w/30% cntgn)	\$80M
PMT+electronics	\$171M
Installation+testing	\$36M
R&D, Water, DAQ, etc.	\$8M
Contingency(non-civil)	\$51M
Total	\$346M

Reference :hep-ex/0608023,
<http://nwg.phy.bnl.gov/fnal-bnl>

Nov 16, 2007